A STUDY OF INCIDENCE OF HOLLOW VISCUS INJURIES IN BLUNT INJURY ABDOMEN

DISSERTATION SUBMITTED FOR

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CERTIFICATE

This is to certify that the dissertation entitled **"A STUDY OF INCIDENCE OF HOLLOW VISCUS INJURIES IN BLUNT INJURY ABDOMEN "** submitted by **Dr.G.SARAVANA KUMAR** to the Faculty of General Surgery, The Tamil Nadu Dr.M.G.R. Medical university, Chennai in partial fulfillment of the requirement for the award of **M.S. Degree in General Surgery** is a bonafide work carried out by him during the period of Dec 2007 – Oct 2009 under my direct supervision and guidance.

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This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai, in partial fulfillment of the requirement for the requirement for the award of **M.S. Degree in General Surgery** to be held in March 2010.

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INTRODUCTION

In civilian life, trauma has always been a serious affliction to the increasingly mobile society. Abdominal injuries are mostly due to blunt trauma, penetrating injuries are also seen in hospital emergency departments.

Solid viscera are most commonly affected in trauma and have attracted greater clinical attention analytical statistical studies. But, abdominal hollow viscus injury is not less common and equally life threatening what with the possibility of exsanguinating bleeding compounded by perforative peritonitis.

In India, there is an appreciable fall in ulcerative and infective perforations due to increasing availability of newer medical tools and better facilities. There is still one type of hollow viscus affliction which seems to be increasing, the one related to trauma [both accidental and non accidental].

In spite of remarkable developments and newer technologies like USG, CT and MRI, good commonsense and clear clinical history taking, skillful clinical examination acumen, simple radiographs bedside

investigations and a clear protocol can help reach a reasonably accurate diagnosis in a remarkably high number of patients with hollow visceral injuries.

The ability to tackle trauma cases, particularly those related to , abdominal hollow viscus injuries is an important yardstick for effectiveness and good surgical skill.

OBJECTIVES

The study aims to

- Describe the patterns of traumatic abdominal hollow viscus injuries.
- Identify the organs in specific forms of injury.
- Attempt to link the morbidity and mortality to the delay in diagnosis and surgery.
- Detail on the deceptive presentations in blunt injury abdomen.
- Produce protocol for the management of hollow viscus injury following blunt injuries in the abdomen.

MATERIALS AND METHODS

I have analyzed fifty cases of blunt abdominal trauma following road traffic accidents, accidental falls from height and assault by various objects admitted in trauma ward during the period of December 2007 to October 2009.

The cases were selected with accurate history of trauma including the mode of injury, with the abdomen showing tenderness, distension, guarding or rigidity with presence or absence of bowel sounds, the time elapsed since injury till admission and history of primary resuscitation were documented carefully. Based on a careful history and meticulous physical examination combined with adjunctive investigations, a decision to operate or to manage conservatively was taken.

Baseline laboratory parameters like blood urea, blood sugar, serum electrolytes and blood grouping was done in all the cases. Plain x ray abdomen in an erect posture was taken for all stable patients. Other investigations appropriately taken for associated injuries.

Ultra sonogram and CT scan abdomen was not done as a routine diagnostic investigation; however few cases were subjected to the same in view of the special circumstances.

A proforma of each case including the age, sex, mode of injury and an accurate history suggesting the mode of injury was compiled. Personal history of previous trauma or surgeries and alcohol or drug intoxication was specifically sought for. Plain skiagram of the abdomen and four-quadrant aspiration was done in all the cases.

All the patients were resuscitated with Ringer lactate solution and/or blood before surgical intervention. All patients were mandatorily maintained on nasogastric suction, intravenous fluid replacement and broad spectrum antibiotics. All cases were catheterized, postoperative complications were specifically sought for and treated appropriately as and when they arose.

EVALUATION OF BLUNT TRAUMA PATIENTS

The type of blunt injury may range from a fall from height, trivial accidents, high intensity impacts, to deliberate trauma directed towards the abdomen and pelvis.

It can be discussed in the following sequence.

Primary survey

Resuscitation

Secondary survey

Definitive management

Actually, Trauma care starts with **PREHOSPITAL CARE and TRIAGE**

After completing primary survey through

- Airway
- Breathing
- Circulation
- Disability
- Exposure

While the patient on resuscitation with **cervical immobilization**, Secondary survey is started from head to toe with an elaborate history.

History of trauma as well as physical examination remains the corner stone of the diagnosis and decision making process. An accurate history with regards to the mode of injury, time elapsed since the incident, deceleration or acceleration, use of restraint devices, evidence of steering wheel or sear belt injury etc should provide a reasonable clue as to the organ or area involved. The clinical picture may be confounded by intoxication and associated injuries like head and thoracic trauma, major orthopedic trauma, initial-resuscitatory efforts.

Physical examination

The general condition of the patient is the best initial guide to diagnosis. Pallor, shallow hurried respiration and other signs of shock should be looked for vital parameters have to be repeatedly documented. Recording pulse and blood pressure to detect hypotension is of paramount importance. Profound hypotension is an indication of significant blood loss into the peritoneal cavity, pleural cavity, retro peritoneum or extremities.

Look for signs of peritonitis by general appearance and attitude of the patient in the bed.

Look

Adequate assessment cannot be made without adequately exposing the patient, therefore remove all the patients clothing.

Look for movement of both hemi thoraces along with all the quadrants of abdomen with respiration for evidence of any intra thoracic injuries, which might need more expedient attention.

Look systematically at the anterior structures, including the urethral meatus, flank and posterior structures the back, the buttocks and perineum for bruises, lacerations, impressions of seatbelts or tyres. Contusions suggestive of pelvic injuries and suspected retroperitoneal injuries require a thorough radiological evaluation. Bladder catheterization after ruling out the possibility of urethral injury is important in assessing genitourinary trauma and if present needs expert urological consultation.

Feel

Palpate for signs of peritonitis like tenderness, involuntary guarding and abdominal rigidity are significant findings and it warrants repeated

clinical examination to rule out the possibility of peritonitis and intraperitoneal bleed.

Palpation both superficial and deep should include all the abdominal structures. The upper level is the fifth intercostal space and muscle rigidity might be slow to develop. Hence repeated reexamination is mandatory and in an absolute necessity, applying compressive force can assess an instability of the pelvic ring. The superior pubic rami and the symphysis should always be palpated. Retroperitoneal injuries are difficult to diagnose but should be suspected if there is a spinal deformity or paravertebral hematoma, or the mechanism of injury suggests injury to retroperitoneal structures. In cases with hematuria, urgent bladder catheterization should be done after ruling out urethral injury. Enquiry regarding the mode of injury might be contributory to the diagnosis.

Listen

The presence or absence of bowel sound and their quality if present should be recorded. The presence of bowel sound does not exclude major abdominal injury.

Rectal examination: rectal examination is essential as loss of integrity of the rectal wall is an indication of large bowel injury. High lying prostate indicates urethral injury.

Vaginal examination: disruption of the pelvis may cause vaginal damage therefore it is mandatory not only to detect the integrity of the vagina but also to detect possible pelvic fractures particularly of the inferior rami.

INTERPRETATION OF PHYSICAL FINDINGS:

Injuries to abdomen may involve solid organs, vascular organs and hollow organs. Interpretation of the physical findings associated with these injuries is often a function of the amount of time that each of these organs require to create peritoneal irritation. The spectrum of injury may range from intra abdominal bleeding with no physical finding except hypovolemic shock to a patient with immediate peritoneal irritation from inflammation following hollow visceral injury. Small intestinal may not produce findings up to 24 hrs, which requires the need of frequent evaluation as an essential part of management protocol, which rests short of definitive diagnosis.

BASELINE INVESTIGATION

1. **Hemograms:**

    Blood Hb / PCV/BT /CT/ Bl`ood grouping /typing

A normal Hb percentage and hematocrit value (PCV) shortly after injury may be misleading because sudden acute shock following hollow viscus trauma may not be adequately reflected by hemogram due to a short time span at presentation.

Blood Glucose and urea/Creatinine

Usually remains normal in acute hollow visceral trauma; however in elderly patients with diabetes and compromised renal parameters, it may show some abnormalities.

Serum electrolytes rarely become abnormal however potassium level is extremely important if laparotomy is contemplated.

Measure if possible serum amylase activity and arterial blood tensions.

2. Urinalysis
3. X-ray chest PA view.
4. Flat / and upright x-ray of the abdomen.

5. Blood Gas analysis
6. USG
7. CT SCAN
8. Laparoscopy
9. Diagnostic Peritoneal Lavage

CXR AND ABDOMEN X-RAY

X ray chest and x ray abdominal in erect posture provides same due to associated thoracic and diaphragmatic injuries. But, Air under diaphragm is much easier to diagnose in an erect film than in an upright abdominal film.

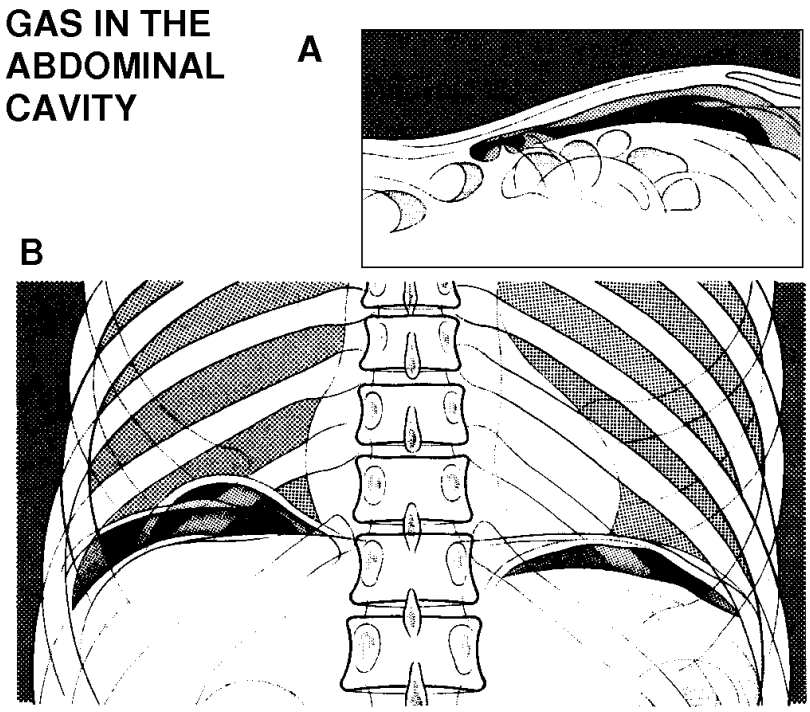
Look for lower rib fractures or either side. This may suggest splenic injuries on the left and hepatic injuries on the right side. Free air under the dome of the diaphragm can be detected in hollow viscus perforation. A properly performed examination can detect as little as 10ml of air. It is seen as a curvilinear collection of air between the line of the diaphragm and the opacity of the Liver. Free air under diaphragm is more difficult to identify in the left side because of the overlapping gas shadows of stomach and splenic flexure of colon. Multiple fluid levels may also be visualized. In upper gastro intestinal tract perforation, the appearance of

pneumoperitoneum may be facilitated by injecting 750-1000ml of air into the nasogastric tube, after which the patient is made to sit-up for 10 min before upright x ray or left lateral decubitus film is taken and compared to the one before injection.

Extensive haemoperitoneum gives the characteristic ground glass appearance. A minimum of 700 ml of free blood has to be present in the peritoneal cavity to give the ground glass appearance.

Loss of psoas and rectal opacities is suggestive of retroperitoneal hematomas and the injured spleen may indent the gastric and colonic air shadows.

Both the decubitus and upright views are important to diagnose intraperitoneal air, when the patients are unable to tolerate the erect position due to pain, or when unconscious; the upright view will not only be difficult to perform but unsafe for the patient. In this situation, a left lateral decubitus view will provide similar information with less risk of pain or injury.



Hepatic angle sign

Loss of definition of the definite inferior and right lateral borders as blood accumulates between the hepatic angle and the right peritoneal wall.

Dog ear sign

Result from accumulation of blood that gravitates between the pelvic walls on either side of the bladder.

Flank strip sign

Fluid dense zone separating the ascending or descending colon from a distinctly visible lateral peritoneal wall.

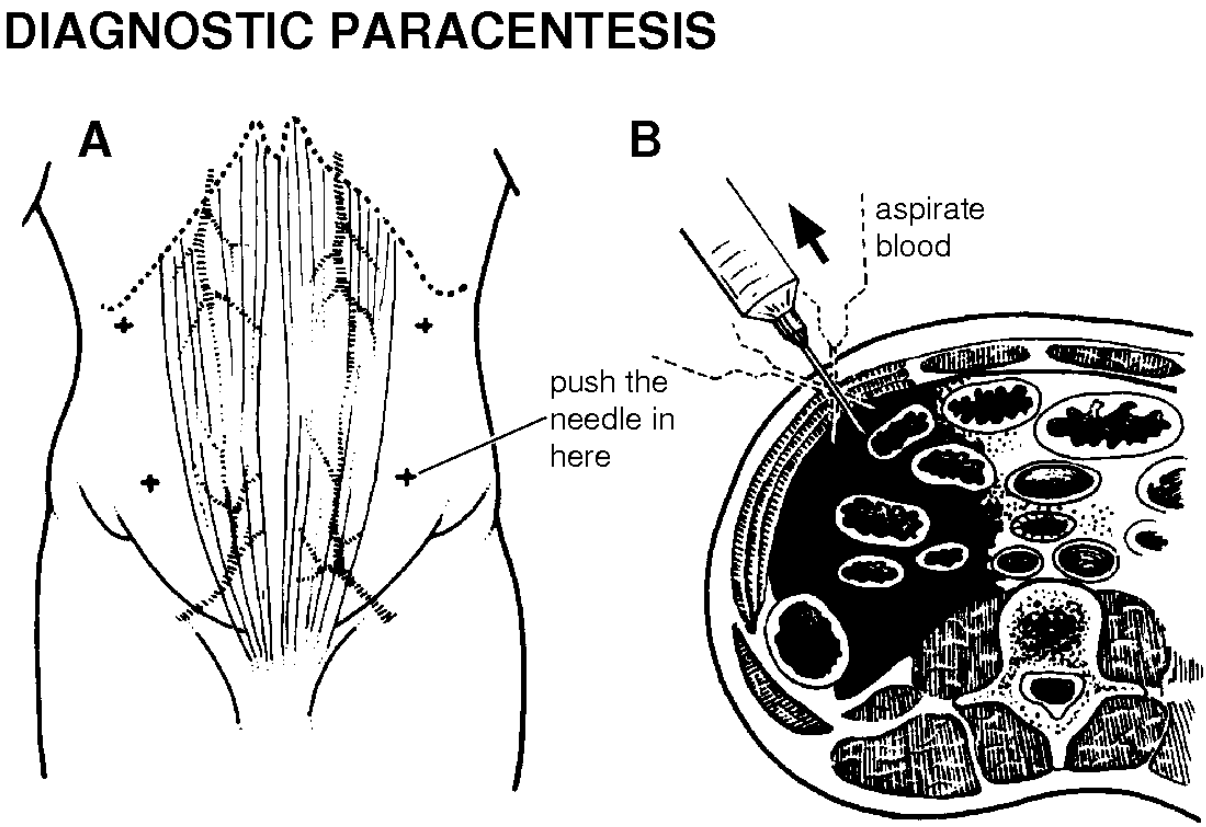
RADIOGRAPHY IN BLADDER / URETHRAL INJURIES

X-ray of the pelvis / abdomen may reveal ground glass appearance in case of Bladder rupture, and may be associated with disruption or fracture of the pelvis. In doubtful cases bladder rupture is established by static cystogram. A Foley's catheter is passed into the bladder if there is no urethral injury. (Or after obtaining retrograde urethrogram if urethral injury is suspected), and a scout film is taken. Anteroposterior, both oblique and post drain films are taken. The use of CT cystography has been advocated as a time saving procedure, but controversial and expensive.

Bladder contusions represent a non-full thickness injury of the mucosa of muscular layer and no extravasation is identified on cystogram. In intraoperitoneal rupture of bladder cystogrpahy shows extravasation of contrast material outlining the bowel loops and filling the paracolic gutters. Whereas in extraperitoneal rupture of bladder the contrast extravasates into the pelvis around the base of the bladder.

FOUR-QUADRANT ASPIRATION

A simple and highly sensitive mode of assessing the presence of blood or fluid collections including faeces in the peritoneal cavity. The sensitivity ranges from 76-90%. A sterile 10 cc syringe should be used for each quadrant, after ensuring sterile precautions needle used should be 18-20G.



PERITONEAL LAVAGE

- Equivalent clinical examination
- Difficulty in assessing the patient because of head injury, alcohol intoxication or drugs.
- Persistent hypotension in spite of adequate fluid replacement.
- Multiple injuries especially those including the chest, pelvis and spinal cord.
- Frank visible breach in the peritoneum.

Contraindications to peritoneal lavage

- The only absolute contraindication to lavage is if there is a preexisting absolute indication for laparotomy. Relative contraindications are pregnancy, gross obesity, coagulopathy and previous lower abdominal surgery.

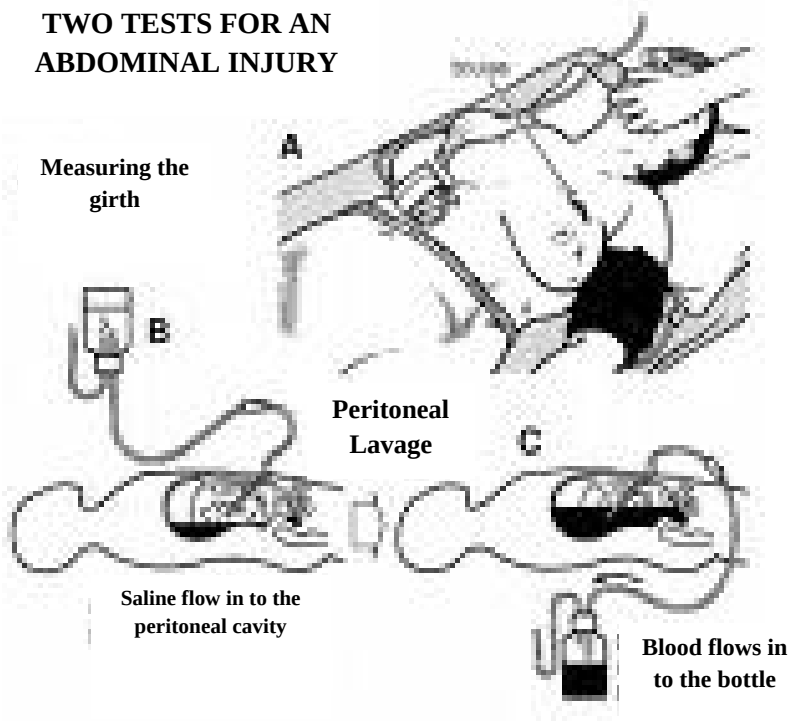
Procedure

1. Explain the procedure to the patient if he or she is conscious.
2. Ensure that the urethral and nasogastric tube is in place.
3. Prepare the patient abdomen with antiseptic and drape sterile.
4. Infiltrate the skin with 2% lignocaine and 1 in 100000 adrenaline.

5. Make vertical subumblical incision in the midline 5 cm in length and centered one third of the distance between umbilicus and symphysis pubis.
6. Under direct vision divide the linea alba and identify the peritoneum.
7. Make an incision and introduce a peritoneal dialysis catheter towards the pelvis without the introducer.
8. Aspirate any free blood or bowel contents if more than 5ml of blood is aspirated then it is an indication for emergency laparotomy.
9. If no blood is aspirated then infuse 1 liter of warm physiological saline at 37 degree centigrade.
10. Allow the saline to equilibrate for three minutes and then place the bag and the giving set of the floor and recover as much of the initial 2 litre as possible.
11. Send a 20 ml sample to the laboratory for measurement of RBC and WBC count and for microscopic examination.

Positive result

- Lavage leaks into the chest tube or urinary catheter.
- Aspirate 5 ml of dark blood.
- Red blood cell count greater than 1000000/ml.
- Presence of bile, bacteria, or fecal matter.



False positive

Occurs in 2% of the cases, particularly when the lavage is performed blind, and is caused by traumatizing abdominal wall vessels or trochar injury to the viscera.

False negative

Occurs in 2% of the cases, mostly attributable to injury to retroperitoneal organs or diaphragmatic injury.

COMPLICATIONS

- Perforation of a viscus
- Hemorrhage from mesenteric vessels
- Infection

Ultra sonogram

It is a non-invasive, investigative modality. It is very sensitive for detecting intraperitoneal fluid collections. May detect retroperitoneal collections also, solid organ injuries can be well delineated.

The principal limiting factors are availability, low specificity and poor localization in the morbidly obese and in documenting hollow viscus injuries, pancreatic injuries and being highly operator dependent.

CT scan

A highly sensitive modality for retroperitoneal and solid parenchymal organ injury can detect intraperitoneal hemorrhage also. However the principal limitations are the time factor, the ability to shift a shocked patient to the scan environment.

In appropriate clinical settings, the lower grades of solid parenchymal injures can be managed conservatively after CT evaluation. Superiority of CT over USG lies in ability to assess pancreatic and renal injuries.

Arteriography

The primary indications are intra abdominal solid organ injury and major vascular breach as in pelvic injuries with arterial bleed. Once detected, then therapeutic embolisation can be carried out. Abdominal arteriograms may be needed in solid organ injuries and persistent major hematuria. The common complication is anaphylaxis to the contrast agent and iatrogenic visceral arterial thrombosis. The contraindications are obvious need for explorative laparotomy, and unwilling patients.

Radio nuclide scanning

A highly specialized subgroup of patients can be submitted to this elaborate investigative work up.

- In the postoperative period for detecting renal arterial flow after primary repair of renal pedicle tear.
- Localization of biliary fistula after a major hepatic repair / resection.

- Obvious affliction of a kidney as detected by a scout IVU.

Laparoscopy

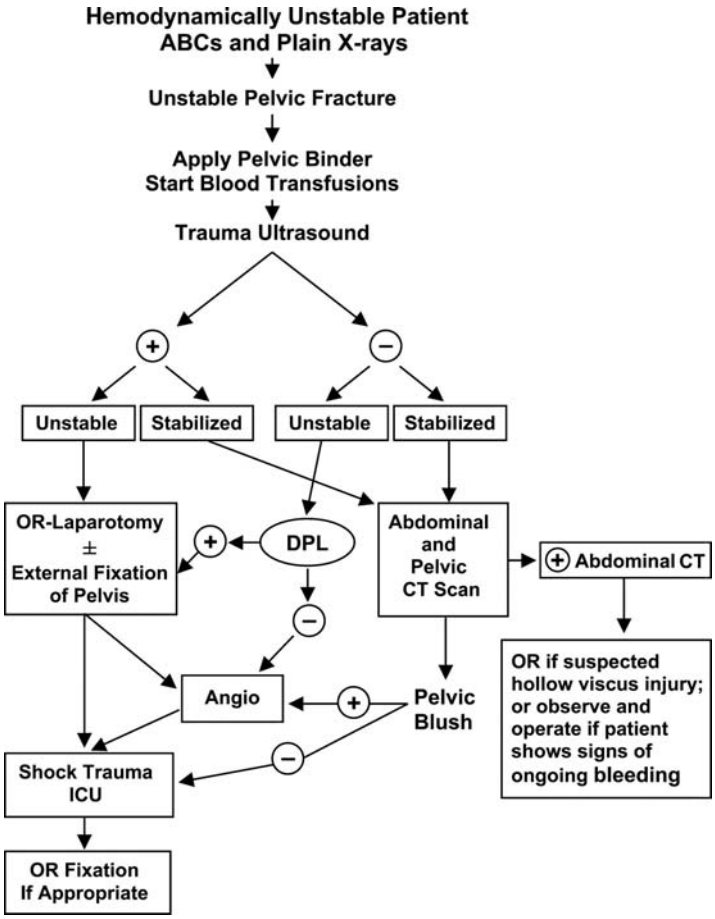
The principal argument in favour this procedure is ability for direct visualization. It should ideally be carried out on table with the facility for rapid conversion into a formal explorative laparotomy on the slightest indication of a major trauma requiring surgical intervention.

The abdominal cavity is examined in a standard fashion beginning a in the right hypochondrium and proceeding in a clockwise manner. The pick up rates are low for splenic injuries, small bowel injuries and in the presence of gross hemoperitoneum. Expertise and availability of experts limits it use in routine examination.

Indications for emergency laparatomy

- Radiological evidence of free intraperitoneal gas.
- Radiological evidence of ruptured diaphragm.
- Positive four quadrant tap is contributory evidence.
- Positive result for peritoneal lavage.
- Rigid silent abdomen
- Unexplained shock

However, most authorities agree that the presence of abdominal rigidity and gross abdominal distension are an indication for prompt surgical intervention. Drugs, alcohol or injuries to head / spinal cord complicate physical examination.



TACTICS OF EXPLORATION

In open injury, the site of entry and the inferred direction of track the chief determinants of the position of abdomen incision. In majority of

cases a long midline incision is adequate, which may be extended transversely either subcostally or inferiorly.

In this days of minimal invasive surgery it, should be emphasized that the vertical incision should be large (20-25cm initially) and extended without hesitation, to visualize paracolic gutters, to thoroughly inspect all abdomen and pelvic organs.

In case of associated chest injuries the thoraco-laparotomy may have to be preferred.

PROCEDURE AT LAPAROTOMY

Any life threatening bleeding occurring due to associated solid visceral injury, should be dealt with early to prevent further deterioration. A formal laparotomy must be carried out by examining and eviscerating all small bowels, so that the pelvis can be examined.. The diaphragm and the solid viscera are examined and then the lesser sac is opened and pancreas examined, colon and duodenum are mobilized and examined.

Only the methodical and minutest examination would reveal the small perforation or serosal disruption, particularly those that are veiled by omentum.

DECISION MAKING

The formal laparotomy permits a total assessment of extent of intra peritoneal damage and allows the operator to assess the priorities and the pattern of treatment. This assessment should help decide on the surgical procedure to be embarked upon. An early decision may help anesthetic and resuscitation needs, and hasten the treatment.

WHAT TO DO AFTER A LAPAROTOMY?

Any intra-peritoneal collection should be sucked out first. If exsanguinating hemorrhage is suspected the origin should be identified and appropriate haemostatic procedures like clamping of the vessels or packing of the organ should be carried out without delay. If need be, the retro peritoneum should be opened when injuries to ascending, descending colon, second and third part of duodenum is suspected.

STOMACH

Gastric injuries often result from penetrating trauma than blunt trauma. Gastric injuries can be occasionally missed if the wound is located in the mesentry of the lesser curvature or high in the posterior fundus, as the stomach is intrathoracic and protected by the rib cage. Even

when injured, it's difficult to diagnose. These perforations may present with ambiguous clinical features. Blunt trauma causing gastric rupture is rare, but may occur after abrupt deceleration, which occurs in seat belt injuries and other blunt abdominal trauma, particularly in the presence of distended stomach.

Diagnosis

The nasogastric tube aspiration usually show blood stained aspirate.

At laparotomy, examination of esophago gastric junction, anterior gastric wall, opening of gastrocolic ligament and complete visualisation of posterior gastric wall should be done.

The stomach should be clamped at the pylorus and inflated with air or injected with methylene-blue-colored saline solution if there is any doubt. Patients with the injuries that damage the nerve of Laterjet or both vagus nerves should have a drainage procedure. If the distal antrum or pylorus is severely damaged, it can be reconstructed with a Billroth I or II procedure.

The post operative complications include intraabdominal abscess particularly in lesser sac and fistulae, following the surgery or as a direct consequence of the injury. Treatment is immediate reoperation and repair.

INJURY SCALE

GRADE	DESCRIPTION OF INJURY
Grade I	Intra mural hematoma <3cm Partial thickness laceration
Grade II	Intra mural hematoma >3cm Small laceration <3cm
Grade III	Large laceration >3cm
Grade IV	Large laceration involving the vessels of greater curvature and lesser curvature
Grade V	Extensive >50% rupture stomach devascularisation

TREATMENT

Grade I & II - Evacuate the hematoma by deroofing and maintain hemostasis .

- Seromuscular closure done in 2 layers

Grade III - Similar to Grade I & II excise the devitalized tissues.

Grade IV - a) Lesion confined to stomach

- Distalgastrectomy &Gastroduodenostomy

b) Associated with injury to duodenum and pancreas

- distal gastrectomy and gastro jejunostomy

c) Associated with injury to cardio oesophageal junction

- Proximal gastrectomy
- End to side oesophagogastrostomy and pyloroplasty

Grade V -Total gastrectomy and Roux-en- y oesophago jejunostomy.

DUODENUM

Perforation/Injuries related to blunt trauma usually involves the second part of duodenum, particularly the posterior wall. Testicular pain

should raise the suspicion of duodenal rupture (retroperitoneal rupture), also pain referred to shoulders, chest and back, may be associated with perforation of the duodenum. Indices of suspicion increase particularly when there is associated,

1) History of deceleration
2) Blood in nasogastric suction
3) Blood/Bile staining of midline retroperitoneum
4) Wounds penetrating upper mid abdomen.

- Adjunctive diagnostic tests for hyperamylassemia as a result of extra vasation of amylase into the abdominal cavity, and increase in the serum amylase though not diagnostic should raise the suspicion duodenal injury.
- Plain x-ray
    - ❖ Mild scoliosis
    - ❖ Obliteration of right psoas shadow
    - ❖ Abscess of air in duodenal bulb
- Gastrograffin study
    - ❖ Duodenal hematoma – coiled spring (or) stackled coin, appearance.

Duodenal injuries usually present with associated pancreatic injuries. Hence, prompt examination of the pancreas too, becomes necessary in case of duodenal injuries as combined pancreatic – duodenal injuries are not uncommon, particularly dangerous because of the risk of duodenal suture line dehiscence, and the development of a duodenal fistula.

A generous Kocher's maneuver is performed to expose the pancreatic head and first two parts of the duodenum, the lesser sac opened widely through the gastro-colic omentum to examine the body and the tail of pancreas and the third portion of the duodenum. Visualization of the fourth portion of the duodenum is facilitated by division of the ligament of Treitz. Limited duodenal contusions are best left along when discovered at laparotomy. Placement of gastrostomy and feeding jejunostomy tube should be considered for extensive contusion when delayed resolution of the hematoma is anticipated.

More perforations of the duodenum can be treated by primary repair using single layer 3-0 monofilament suture material, taking care that the largest possible residual lumen is left.

Extensive injuries of the first part of duodenum is usually dealt by debridement and anastomosis, due to presence of good mobility and rich blood supply of distal gastric and pylorus. In contrast , complex injury to the second part of duodenum is complicated due to its fixity to pancreas, its blood supply and the ducts which may necessitate complex anastomosis procedures like Roux-en-Y duodeno-jejunostomy. Injuries to the third and fourth portions of the duodenum with tissue loss is further compounded by a short mesentery which limits mobilization and increases the risk of ischemia. End to end anastomosis may be complicated by duodenal fistulas.

Complications

Post operative bleeding is the most important complication. Duodenal fistulae occurs in 5 to 10% of patients following anastomosis, it is usually managed non-operatively with naso gastric suction, nutritional support and aggressive stoma care. Uncomplicated fistulae close by 6 weeks, those which do not, are treated by surgery.

- Abscess formation – 10-20%

DUODENUM INJURY SCALE

Grade	Type of injury	Description of injury
I	Hematoma	Involving single portion of duodenum
	Laceration	Partial thickness, no perforation
II	Hematoma	Involving more than one portion
	Laceration	Disruption <50% of circumference
III	Laceration	Disruption 50-75% of circumference of D2 disruption 50-100% of circumference of D1, D3, D4
IV	Laceration	Disruption >75% of circumference of D2 Involving ampulla or distal common bile duct
V	Laceration	Massive disruption of duodenopancreatic complex
	Vascular	Devascularization of duodenum

Treatment

Grade I & II - Within 6 hours – simple primary repair and NG aspiration

> 6 hours – duodenal decompression

- Transpyloric duodenal decompression
- Tube jejunostomy
- Tube duodenostomy

Grade III - Primary repair

Pyloric exclusion and drainage

Roux—en-y duodeno jejunostomy

Grade IV - Primary repair of duodenum and CBD and T tube drainage (or) choledochoenteric Anastomosis (or) Pancreaticoduodenectomy rarely needed.

Grade V - Pancreaticoduodenectomy

GALL BLADDER AND DUCTAL SYSTEM

These injuries though not so common, may be associated with concomitant liver injuries, duodenal injuries and pancreatic injuries. Perforations / rupture of GB due to blunt trauma are very unusual.

PANCREATIC INJURY

It is rare accounting for 10-20% of all abdominal injuries. Most often such injuries are caused by penetrating injury.

Diagnosis

- Isolated pancreatic injury is rare.
- Seat belt sign may be clinically evident
- Increased serum (or) urinary amylase after blunt injury is not diagnostic.
- Contrast duodenography – widening of C-loop
- CT – has a major role in evaluating pancreatic injury.

PANCREATIC INJURY SCALE

Grade	Type of injury	Description of injury
I	Hematoma	Minor contusion without duct injury.
	Laceration	Superficial laceration without duct injury.
II	Hematoma	Major contusion without duct injury or tissue loss.
	Laceration	Major laceration without duct injury or tissue loss.
III	Laceration	Distal transection or parenchymal injury with duct injury.
IV	Laceration	Proximal transection or parenchymal injury involving ampulla.
V	Laceration	Massive disruption of pancreatic head.

Treatment

Grade I & II - Deroofing and maintaining hemaostasis (or)

Evacuation and closed drainage.

MORTALITY RATE - 10-25% (most of them are due to associated injuries.)

SMALL INTESTINE

Small bowel is one of the most frequently injured organ following penetrating injury to the abdomen, it also occurs following blunt trauma.

DIAGNOSIS

Clinical signs

- Seat belt sign
- Pointing sign
- Haemodynamic instability may be present

Plain X-ray abdomen - Free air under diaphragm

DPT - Not reliable

CT with oral and IV contrast - Significant false negative results

Free fluid in abdomen without any solid organ injury one should suspect small bowel injury.

Simple closure in two layers is the treatment of choice in perforations following blunt injuries after trimming the edges. Resection may have to be carried out if the following criteria are present in the bowel injuries:

1) Injuries that cannot be closed without significantly narrowing the bowel lumen.
2) Large irregular wounds.
3) Short segments containing multiple perforations.
4) Areas that are infracted or crushed and are unviable.
5) Injury to the leaves of mesentery.
6) Large hematomas at the mesenteric border.
7) Large intra-mural haematoma.
8) Avulsion of mesentery.
9) Large transverse fear in the mesentery.
10) Long linear lacerations of the bowel.

Standard anastomotic techniques can be used for bowel repair without compromising blood supply. Simple serosal tears and circumscribed areas of contusion can be treated by Lembert sutures applied to the serosal coat.

The complications may be:

- Intra abdominal abscess - to be treated by drainage.
- Anastomotic leakage
- Entero cutaneous fistula - Conservative treatment, if low output. Surgical treatment, if high output
- Intestinal obstruction - Naso gastric suction and parenteral nutrition.

SMALL BOWEL INJURY SCALE

Grade	Type of injury	Injury Description
I	Hematoma	Contusion or hematoma without devascularization
	Laceration	Partial thickness, no perforation
II	Laceration	Laceration <50% of circumference
III	Laceration	Laceration ≥ 50% circumference without transection
IV	Laceration	Transection of the small bowel
V	Laceration	Transection of the small bowel with segmental tissue loss
	Vascular	Devascularized segment

Treatment

Grade I - Repair by suturing the seromuscular layer

Grade II - Closed primarily in 2 layers transversely (so obstruction prevented)

Grade III - (Mesentry intact and lumen adequate)

- Closed primarily in 2 layers.

Grade IV & Grade V - (Mesentry is disrupted or lumen is inadequate)

Resection of unviable portion and primary end to end anastomosis.

MESENTERIC HEMATOMA

All mesenteric hematoma should be explored because these may hide small bowel injury.

COMPLICATIONS

- Enteric leakage
- Intra abdominal abscess
- Short bowel syndrome

COLON AND INTRAPERITONEAL RUPTURE OF RECTUM

Diagnosis

- Features of peritonitis.
- X-ray air under right dome of diaphragm.
- Triple contrast CT – contrast extravasation.

COLON INJURY SCALE

Grade	Type of injury	Injury description
I	Hematoma	Contusion or hematoma without devascularization.
	Laceration	Partial thickness, no perforation
II	Laceration	Laceration <50% of circumference
III	Laceration	Laceration ≥50% of circumference without transaction.
IV	Laceration	Transection of the colon
V	Laceration	Transection of the colon with segmental tissue loss.

Risk factors for primary closure

- ❖ Diagnosis after 4-6 hours of injury.
- ❖ Prolonged shock (or) hypotension.
- ❖ Gross contamination of peritoneal cavity.
- ❖ Associated colonic vascular injury.
- ❖ 5 to 6 units of blood transfusion.
- ❖ Need of a mesh for abdominal closure.

Several reports confirm that primary repair within 2 hrs dramatically decreases the incidence of infectious complications.

TREATMENT

Grade I & II

- ❖ Evacuate hematoma and close injury primarily

Grade III

- ❖ No risk factors – close primarily
- ❖ Risk factors present – treat with colostomy (or) repair with proximal diversion colostomy.

Grade IV

Treat with colostomy (or) repair with proximal diversion colostomy. For large grade IV caecal and right colonic injuries, treat with resection and ileostomy.

Grade V Treat with colectomy and colostomy.

RECTOSIGMOID AND RECTAL INJURY

They are uncommon; most rectal injuries are due to gun short wound and pelvic fractures. They can be intraperitoneal (or) extraperitoneal.

TREATMENT

Grade I & II injury below sphincter

- ❖ Close primarily

Grade II (above sphincter) and Grade III & IV

- ❖ Proximal loop sigmoid colostomy with rectal drainage.

Grade V

- ❖ Proctocolectomy and colostomy

Complications

- Sepsis
- Pelvic abscess
- Urinary and rectal fistula
- Rectal and Urinary incontinence
- Stricture
- Loss of sexual function

BLADDER

Decisions are based on the location and the extent of injury. Intraperitoneal rupture of bladder should be explored and repaired via transabdominal incision so as to allow exploration of abdomen for associated injuries. Any extraperitoneal tear should be closed from within the bladder using a single running layer of chromic categut or polyglycolic suture. The ureteral orifices should be inspected for injuries, if necessary, passage of ureteral catheters into each ureter helps identification of ureteral or ureteral orifice injuries. A large caliber

suprapubic catheter is placed near the dome of bladder and brought out through a separate stab incision in the bladder and skin.

Most cases of extraperitoneal bladder rupture due to blunt injuries do not require operative intervention and heal within 7-10 days by urethral drainage only. However, if laparotomy is performed for associated intraperitoneal injuries, intravesical repair of the bladder can be done. The perivesical haematoma should be left undisturbed.

NEWER CONCEPTS

ABBREVIATED LAPAROTOMY

This concept includes rapid access to the peritoneal cavity, bleeding control and repair of the injured organs. This sequence results in the definitive repair of most lesions and is appropriate for most patients, but multivisceral and exsanguinated patients are bed candidates for major resections and time consuming reconstructions.

The physiological environment is important for understanding damage control strategy. The heat loss during these procedures is some times worsened because of massive transfusions and cool IV fluids

leading to hypothermia. Hypothermia in turn leads to coagulopathy due to platelet dysfunction. The planned intervention is made 24-28 hrs after the initial intervention.

Indications for damage control strategy are:

- Bleeding caused by coagulopathy.
- Hypothermia during operation.
- Inability to control haemorrhage.
- Inability to close abdominal cavity formally.

The key is the early decision

The rationale for damage control procedure is

1. Initial operation
2. Resuscitation at ICU
3. Planned reoperation

In the initial intervention the surgeon does the minimum to save the life. The technique is focused on haemorrhage and contamination to stop bleeding and control intestinal leak respectively. After this abbreviated procedure, the patient is resuscitated at ICU.

ABDOMINAL HYPERTENSION

It was first described by Richardson and Trinkle in 1976.

When the pressure of abdominal intracaval pressure increase to 10 mm Hg they noticed a decrease in venous return and when it was >25mm Hg the airway pressure is increased.

With severe bowel edema, either retention sutures on the abdominal wall or suturing the skin and leaving only the fascia open can be done.

Sometimes closure is impossible. In that case a plastic bag of saline solution (or) soft mesh was used. Abdominal hypertension caused by trauma (or) laparotomy can result in abdominal compartment syndrome characterized by respiratory, hemodynamic and renal problems.

ABDOMINAL COMPARTMENT SYNDROME

It may be defined as a condition in which an acute increase in pressure within a confined anatomic space adversely affects the viability and function of the tissue within.

Acute elevation in intra abdominal pressure in a setting of trauma may occur as a result of intra abdominal or retroperitoneal hemorrhage, visceral edema and use of abdominal peak.

Features

- Decreased cardiac output
- Increased systemic vascular resistance
- Decreased venous return
- Increased intra thoracic pressure
- Increased peak airway pressure
- Ventilation perfusion mismatch
- Impaired renal hepatic and abdominal visceral blood flow.

Clinical Features

- Tensely distended abdomen
- Depressed cardiac output
- Hypoxia due to increased airway pressure.
- Oliguric renal failure

Confirmation

- Measuring the intra abdominal pressure by needle.
- Determination of urinary bladder pressure.

Treatment

- Immediate decompression
- Silastic sheets or irrigation may be used for temporary closure.

FAST

FOCUSSED ASSESMENT WITH SONOGRAPHY FOR TRAUMA

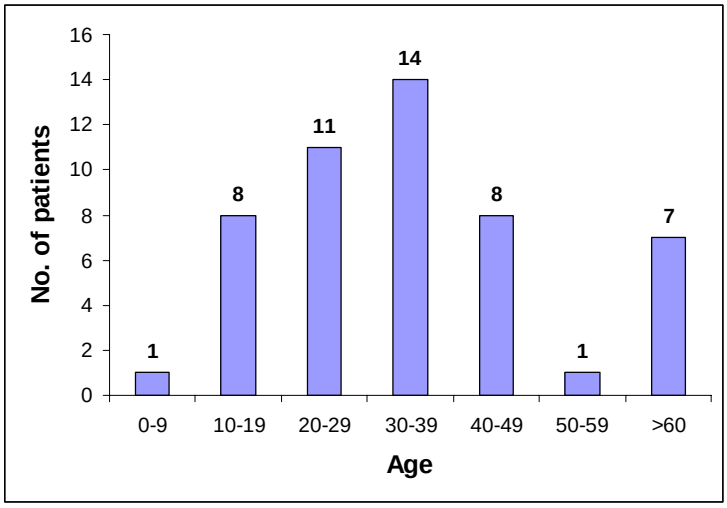
It is rapid and accurate for the detection of intra abdominal fluid or blood.

If haemoperitoneum is detected in an unstable patient, it is an indication for emergency exploratory laparotomy. A hemodynamically stable patient who is found to have haemoperitoneum on FAST is an indication for further evaluation with CT.

RESULTS

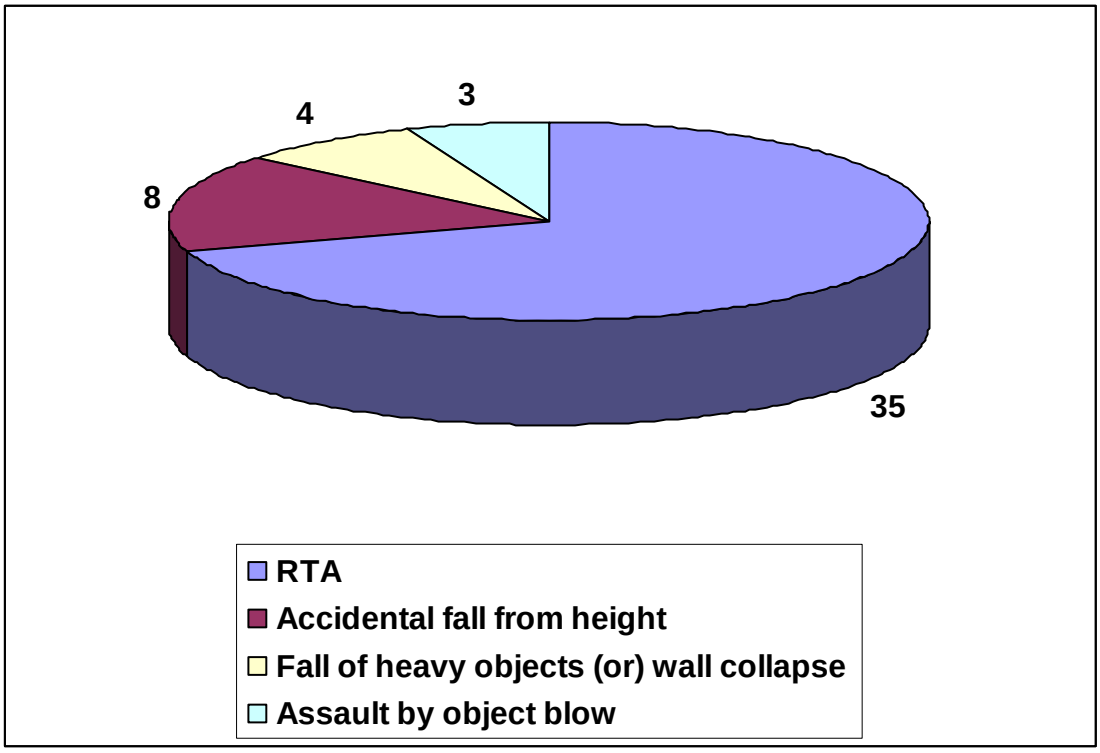
Age

The age incidence of blunt injury is highest for the age group 30-39 years which constitutes 28 % of the study population.



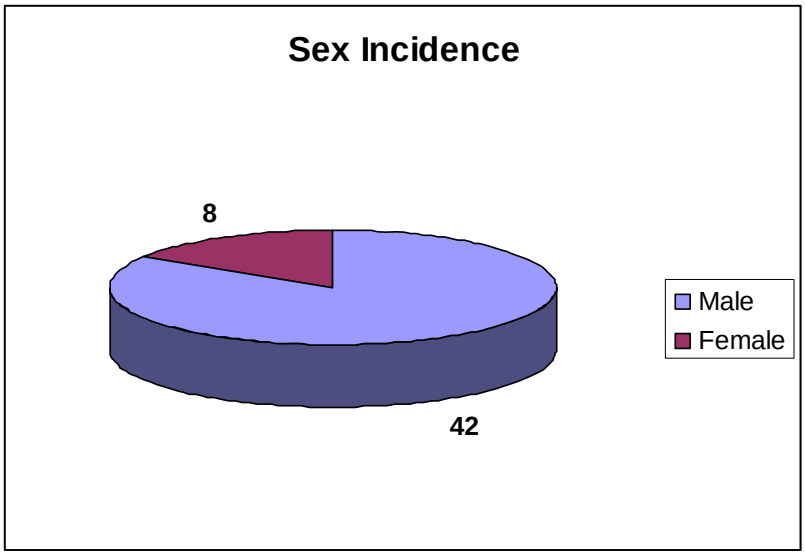
Age group	No of patients
0-9	1
10-19	8
20-29	11
30-39	14
40-49	8
50-59	1
>60	7

Nature of blunt injury abdomen in our study



Mode of injury	No of cases
RTA	35
Accidental fall from height	8
Fall of heavy objects (or) wall collapse	4
Assault by object blow	3

Male – 84%, Female – 16%

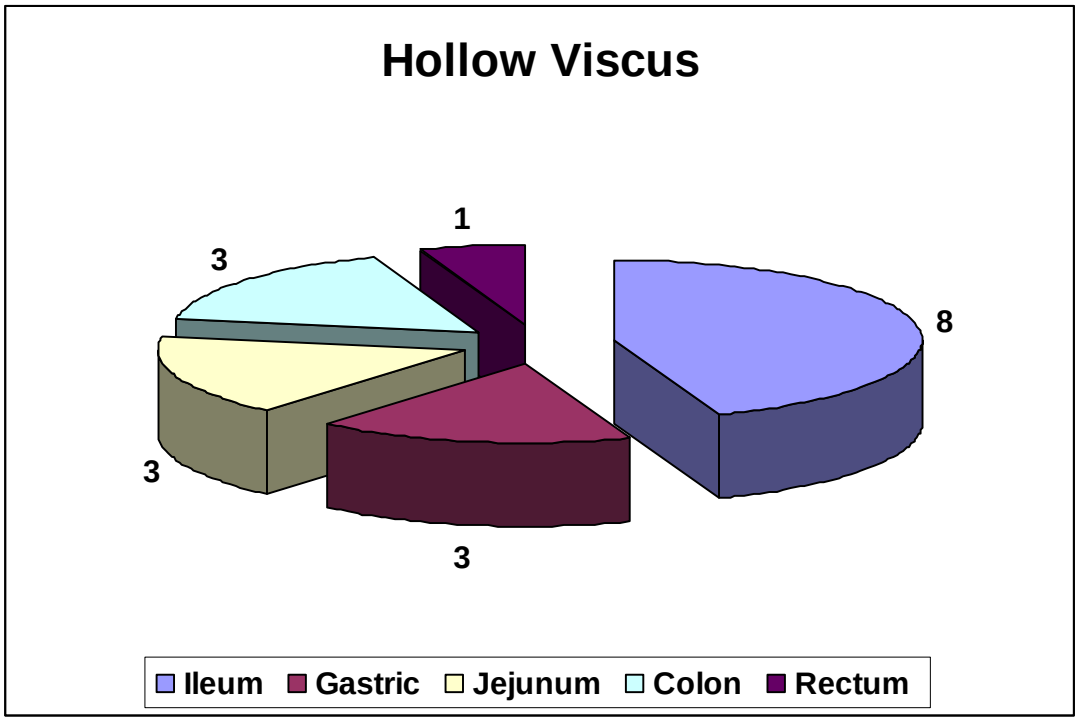


Organs of blunt injury abdomen

Organ	No. of cases
Stomach	3
Jejunum	3
Ileum	8
Spleen	8
Liver	8
Pancreas	1
Mesentry	**3**
Colon	**3**
Rectum	1
Retroperitoneum	3
Bladder	1
Renal	3

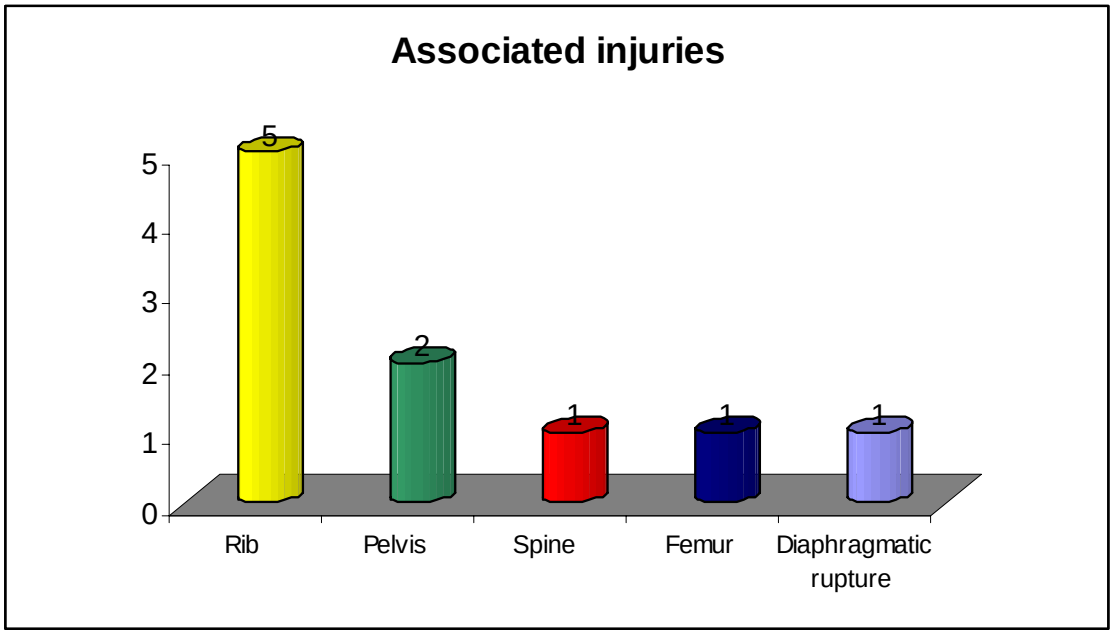
Among the hollow viscus injury which constitutes 36% of our cases the ileum got injured mainly (44.4%)

Hollow viscus	No. of cases	%
Ileum	8	44.4
Gastric	3	16.6
Jejunum	3	16.6
Colon	3	16.6
Rectum	1	5.55



Associated injuries

Site	No of cases
Rib	5
Pelvis	2
Spine	1
Femur	1
Diaphragmatic rupture	1



DISCUSSION

In our study of blunt injury abdomen caused to road traffic accidents, accidental falls from height and assault by objects, observations were male in 50 cases admitted in Govt Rajaji Hospital, Madurai Medical College from December 2007 to October 2009. 5 cases were under 15 years of age and 38 cases were between the ages of 15 and 45.

Males accounts for 42 cases [84 %]. The proportionate majority of males could account for the male preponderance involved in vehicular traffic and outdoor activities, also to a certain extent by gender related aggressive driving behavior.

Solid organ injuries like liver and splenic injuries due to direct compressive forces resulting from collision. Hollow viscus injuries might have been contributed by deceleration shear stress and sudden increase in intraabdominal pressure.

37 patients were admitted within 12 hours of the accident and the mortality in this group was one accounting for 2.7%. Eleven patients came on the second day after having been treated in mofasul hospitals and the mortality in the group was one, calculated as 9%, this case is a liver

injury died postoperatively due to a combination of factors like protracted shock, septicemia and coagulopathy with multiple organ dysfunctions.

Two patients were admitted after 72 hours and the mortality in these 2 pts was 2 accounting for 100%. Peritonitis and associated bony injuries were the cause of death in these patients who were not assessed and resuscitated adequately in the peripheral hospitals.

Twenty patients [40%] were hemodynamically unstable at presentation and required aggressive resuscitation. The Connecticut and saffolk studies show 44% shock incidence noted at the time of presentation.

Physical examination revealed abdominal bruises in 10 patients and abdominal pain in all the patients and distension in 18 patients. Guarding was noted in 38 patients Rigidity was noticed in 19 patients. Davis et al reported abdominal pain in 75% of the patients; rigidity and rebound tenderness in 25% and 45% were clinically silent cases.

Associated major injuries increase the mortality and morbidity. The most common associated injuries were limb injuries followed by chest and head injuries. Basic laboratory investigations were of limited value. Plain skiagrams of the chest and abdomen revealed pneumoperitoneum in

11 cases and ground glass appearance in 19 patients. Fracture of the 10th and 11th rib was seen in three cases of splenic injury. Peritoneal tap has an accuracy ranging from 50 to 90% as was reported in a university of Toronto study 80% of the patients had a positive tap finding corresponding with the laparotomy findings. In our series, 40 patients [80%] had a positive peritoneal.

Hollow viscus injury [36%] was the commonest injury detected in our series followed by splenic [16%] and hepatic injuries [16%].

Retroperitoneal hematoma was seen in 2 cases, one of whom had either a CT scan or USG evaluation during the in hospital period. No associated injury was noted in any of these cases.

Associated head injury was seen in 1 patient who recovered completely with conservative management for the same.

Seven cases presented with blunt injury abdominal findings with hemodynamic stability were treated conservatively. Two of them had renal injuries, one had liver and the other had spleen with the rest had no imaging abnormalities.

Splenic injuries amounted to 16% of our cases. Three of the patients were hemodynamically stable at presentation. High velocity RTA was

recorded consistently in all cases except one which is an assault by heavy object blow.

Cobgil et al have reported that CT scan has a high sensitivity and efficacy in detecting splenic trauma. splenic salvage should be attempted if the condition of the patient, age and the spleen allows operative repair.

Splenic injuries in our series were treated primarily by splenectomy except one case which is treated conservatively.

Hepatic injuries there were 8 cases [16%]in our study and all of them gave history of direct trauma to all the right hypochondrium. Among these ten cases were found to involve the right lobe. One case was due to accidental fall from height. Shock was seen in 6 patients. Peritoneal tap revealed hemoperitoneum in 7 cases. One patient was admitted after 72 hours and he succumbed to death on the fourth postoperative day. Hepatoraphy was done in 6 cases, and one case was managed by packing. A case of hematoma right lobe of liver was managed conservatively with serial CT and frequent monitoring of vital parameters.

CONCLUSION

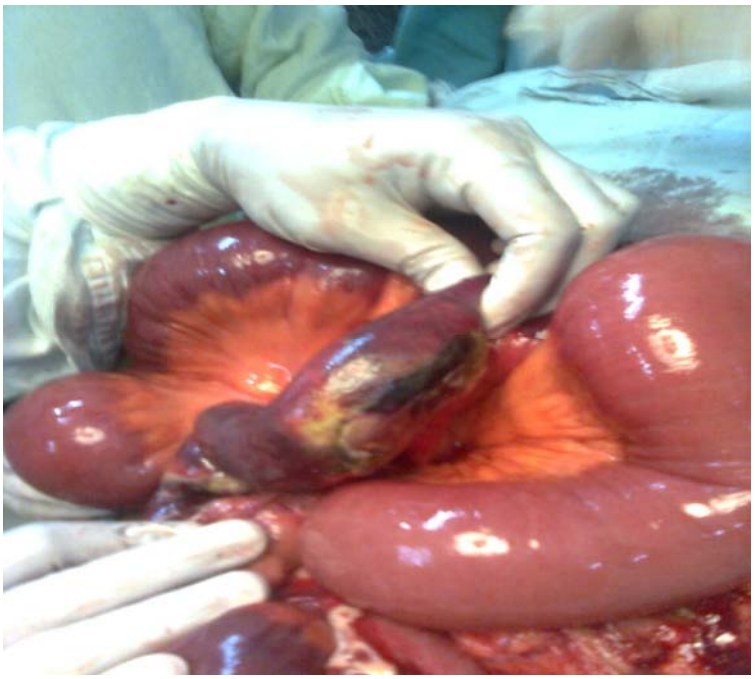
1. Blunt trauma to the abdomen in road traffic accidents, accidental fall from height and assault by object blow cause life threatening injuries in a significant number of cases.
2. The principal organs involved are in the order of incidence – hollow viscus, liver, spleen.
3. Males predominantly in the age group of 15-45 are the most affected.
4. There is an increased incidence of complications and mortality when there is:
    a. Inordinate delay in presentation and decision on treatment.
    b. Inadequate pre-operative resuscitative measures.
    c. Other unrelated risk factors for surgery.
    d. The surgical procedure undertaken is unduly prolonged and complicated.
5. In the high risk patient who present with otherwise profound hypotension in spite of resuscitation it is safer to do laparotomy than to miss important injuries. In our study most of our cases were

operated on the basis of physical findings and repeated clinical examination. This holds good for our country and other developing countries also.

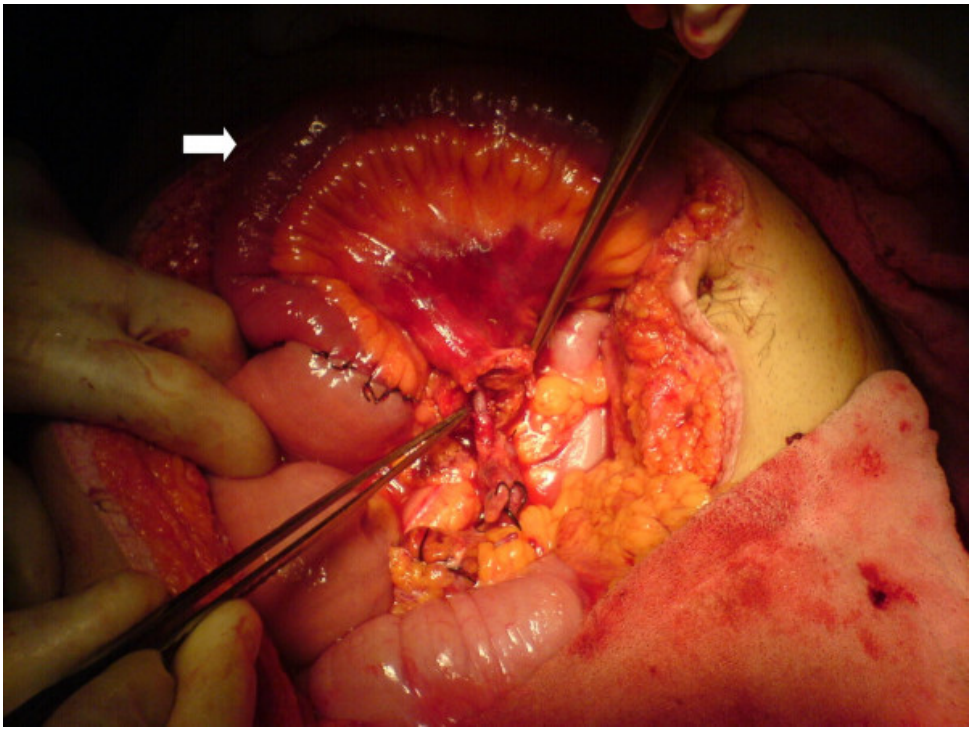
- An attempt at splenic conservation is advocated especially in younger individuals.
- Low grade hepatic injuries in stable patients can be managed conservatively with serial evaluation through clinical and imaging modalities.

6. Since most of the cases were Medico-legal, the surgeon is biased towards an active surgical intervention without equivocating, so as not to miss even a minor injury or a masquerading majority injury.
7. The proper management of traumatic hollow viscus injuries requires the application of good clinical acumen, quick decisions, technique an adequate post-operative back up facilities and care. But, Technology is and always will be just a tool whereas qualified surgeons are irreplaceable.

JEJUNAL INJURY



ILEAL INJURY WITH MASESNTRIC TEAR



PROFORMA

S.No :

Name : Age/Sex: I.P.No.:

Address: Date of Injury:

Date of Arrival:

Nature of Injury: Accidental Fall /RTA/Objects

Complaints : Plain / distension / hematuria

Present H/o:

Time duration from injury to GRH

G/E: Pallor – Yes/No

P/A- Soft Yes / No

Guarding Yes / No

Rigidity Yes / No

Diagnosis:

Investigators

CXR

X-ray abd:

USG: Free Fluid Yes/No Solid Organ:Liver/ Spleen/ Kidney

CT ABD and Pelvis:

Treatment: Conservative /Surgery

Finding:

End result

BIBLIOGRAPHY

1. SCHWARTZ – Principles of Surgery
2. Hamilton Bailey – Principles of Emergency surgery.
3. Maingot's – Abdominal surgeries
4. Current – Surgical Diagnosis and Management
5. Bed-Mexiachem diagnostic and interventional radiology in trauma.1999.
6. Bailey and Love, short practice of surgery, 25thd edition 2009.
7. Besworth BM, Perforation of small bowel in blunt trauma. 2009.
8. Blungar LH, Hepatic resection for injuries 2000.
9. Cook DE, Vick CW, upper abdominal trauma, 2001.
10. Felician, patterns of injury 127 trial, mantox, 1999.
11. Goldstein AS, Scaiefani et al, diagnostic superiority of CT 2002.
12. Gris RA, Colher GS, blunt trauma abdomen. American journal of Traumatology, 2002.
13. Das, clinical methods, examination of abdominal injuries, 2001.
14. Gold D, Mecan NE, hepatic trauma. Packing and draining 1997.
15. Trauma in urban Indian Journal of surgery, 1999.

16. Karzaan Rs, radiology of blunt trauma abdomen, Journal of interventional radiology, 2000.
17. Moccre EE, Mathian IS, Mosers GE, Small intestinal injuries 2002.
18. Perior Maniche Richard C et al. selection conservation is abdominal injuries European journal of surgery 1999.
19. Boyle EM, Maier RV. Et al. Diagnosis of injuries after stab wound to the back and flank. J. Trauma 42, 260, 1997.
20. Branney SW, Moore EE, et al. Ultrasound based key clinically pathway reduces the use of hospital resources for the evaluation of blunt abdomen: A potential lamination of focused abdominal sonography for trauma (FAST) J trauma 42, 617, 1997.
21. Davis JJ Cohn I, Nance FC. Diagnosis and management of blunt abdominal trauma. Ann Surg 183:672, 1996.
22. Goldstein AS, Sclafani SJ, et al: The diagnostic superiority of computerized tomography. J. Trauma 25-938. 1985.
23. Jaffin JH, Ochsner MG et al: Alkaline phosphatase level in diagnostic peritoneal lavage fluid as a predictor of hollow visceral injury. J Trauma 34 :829, 1993.

24. Jacobs DG, Angus L, et al : Peritoneal lavage white count: A reassessment. J. Trauma 30 : 607, 190.
25. Root HD, Hauser CW et al. Diagnostic peritoneal lavage surgery 57: 633, 1995.
26. Smith RS, Fry WR et al : Therapeutic laparoscopy in trauma. Am J Surg 170: 632, 1995.
27. Sosa JL, Arrillaga A, et al: Laparoscopy in 121 consecutive patients with abdominal gunshot wounds. J Trauma 39-501, 1995.
28. Burham RM, Buckley J, et al: Management of blunt hepatic injuries Am J Surg 164; 477, 1992.
29. Aaehain JA, Felldans DV; et al: Management of duodenal injuries Curr Probt Surf 30: 1021, 1999.
30. Bonwman DL, Weaver NW, Walt AJ. Serum amylase and its isoenzymes. A clarification for their implications in trauma. J Trauma 24, 573, 1994.
31. Feliciano DV, Martin TD et al. Management of combined pancreaticoduodenal injuries. Ann Surg 205, 673, 1987.

MASTER CHART

S.No	Name	I.P.No	Age	Sex	Mode of blunty injury	Investigations			Treatment	End Result
						X.Ray	USG	CT		
1	Gulam Batch	46186	23	M	RTA	Air Diaphram	-	-	Ileal perforation closure	Discharged
2	Amalapushpam	47591	31	F	RTA	-	Hemoperitoneum splenic rupture		Splenectomy	Discharged
3	Rajadurai	48389	15	M	RTA	-		Hemoperitoneum + perineal laceration	repair with proximal diversion colostomy	Discharged
4	Babu	86562	38	M	RTA	Air under Diaphragm	Free fluid (+)	-	Ileal perforation 40 cm form ICI - RA	Discharged
5	Udhayakumar	32920	6	M	Accidentia l Fall		Minimal hemoperitoneum ® kidney lower lobe hematoma not expanding on RPT USG	-	Conservative	Discharged
6	Jayapaul	052578	40	M	RTA	ground glass appearance			Necrosectomy of Pancreas	Discharged
7	Sekar	053708	45	M	Accidentia l Fall				Mesenteric tear repair	Discharged
8	Sivakumar	054810	27	M	RTA		Hemoperitoneum + spleen shattered	® Kidney +	® Nephrectomy + splenectomy	Discharged
9	Palaniammal	055845	22	F	RTA		Free (+) fluid		Liver laceration sutured	Discharged
10	Pandi	36361	19	M	Wall Collapse		No evidence of solid organ injury		Conservative	Discharged
11	Harikrishna	36342	50	M	Wall Collapse	dilated bowel loops			Conservative	Discharged
12	Raman	36143	45	M	Blow by object				Conservative	Discharged
13	Alagu	55786	35	M	RTA				Splenectomy	Discharged
14	Vellaisamy	59045	35	M	Occupatio nal Object fall				Mesenteric hematoma + tear repaired	Discharged

S.No	Name	I.P.No	Age	Sex	Mode of blunty injury	Investigations			Treatment	End Result
						X.Ray	USG	CT		
15	Karuppasamy	59096	12	M	RTA	#FEMUR air under diaphragm			Jejunal Tear primary closure and ext fixation	died
16	Murugeshwari	59791	39	F	RTA				Retroperitoneal Hemotoma	Discharged
17	Kanagavel	060480	32	M	RTA	air under diaphragm			Gastric perforation - Primary closure	died
18	Pothumponnu	061310	35	F	RTA	# ribs (L)			Splenectomy + Diaphragmatic suture	Discharged
19	Deivendran	063416	38	M	RTA	#ribs [R]			Liver laceration	Discharged
20	Akilash	065340	22	M	height-occupational	T12-L1 #			Retroperitoneal hematoma + Omental tear	Discharged
21	Selvam	065647	20	M	RTA				Tranverse colon hematoma - resection anastomosis	Discharged
22	Selvaraj	065982	20	M	RTA				Splenectomy	Discharged
23	Karthik	066087	21	M	RTA	# Lower ribs (L)			Splenectomy + (L) ICD	Discharged
24	Palanisamy	067036	20	M	Blow by object	# Lower ribs (L)			Splenectomy	Discharged
25	Gunasekaran	068523	12	M	Accidential Fall	Air under Diaphragm			Ileum laceration - Resection Anastomosis	Discharged
26	Mariammal	069040	65	F	RTA	Air under Diaphragm			Flank Drainage	died
27	Mookammal	069959	45	F	RTA				Mesenteric tear sutured	Discharged
28	Raju	070443	61	M	Accidential fall from height				Liver Laceration sutured	Discharged

S.No	Name	I.P.No	Age	Sex	Mode of blunty injury	Investigations			Treatment	End Result
						X.Ray	USG	CT		
29	Madasamy	070615	38	M	RTA	ground glass appearance			Gastric perforation - Primary closure	Discharged
30	Antony	072696	38	M	RTA				Splenic flexure hematoma Transverse	Discharged
31	Nalluthevar	072489	75	M	RTA	ground glass appearance			Ileal perforation - Primary closure	Discharged
32	Kumar	073443	32	M	RTA	#9,10and 11 ribs[R]			Liver laceration - partial hepatectomy and ICD [R]	died
33	Ammani Ammal	074641	60	F	RTA	Air under Diaphragm			Ileal perforation - Resection closure	Discharged
34	Muthuirulan	074880	65	M	RTA	Air under Diaphragm	Free fluid (+)		Ileal Laceration - primary closure	Discharged
35	Sakthi Pandiyan	035869	13	M	Accidentia l fall	-	Free fluid (+)	liver laceration[R] lobe	Conservative	Discharged
36	Ganesan	035180	16	M	Blow by object	Air under Diaphragm multiple fluid levels (X)	-		Jejunal tear - primary closure	Discharged
37	Andiyappan	039294	75	M	Accidentia l fall	Multiple Air fluid level (X)	-		Ileal tear - Resection Anastomosis	Discharged
38	Lakshmanan	031382	35	M	RTA		Free fluid (+)	® Kidney contusion + liver laceration	Liver Sutured	Discharged
39	Rakku	027602	45	F	RTA		-		Liver laceration - Anterior + Superior surface - sututred	Discharged
40	Muthukumar	031976	22	M	RTA	-	-	Liver Laceration Hemoperitoneum	Liver Laceration - Sutured	Discharged
41	Vellaisamy	85868	28	M	RTA	-	-	-	Greater curvature of stomach laceration + tranverse mesocolon contusion	Discharged
42	Ayyanar	097209	40	M	RTA	-	(L) Kidney laceration		Conservative	Discharged

S.No	Name	I.P.No	Age	Sex	Mode of blunty injury	Investigations			Treatment	End Result
						X.Ray	USG	CT		
43	Ponram	3956	23	M	Accidentia l Fall	-	Peri splenic hematoma		Retroperitoneal hematoma in caecum + absending + descending colon	Discharged
44	Saravanan	36119	31	M	RTA	-	-	splenic laceration	conservative	Discharged
45	Muthuramalingar	075846	13	M	RTA	# superior pubic ramus	-	-	Bladder Tear-repair	Discharged
46	Ganesan	078397	45	M	RTA	Air under diaphragm and undisplaced pubic symphysis#			Rectal laceration - sigmoid colostomy	Discharged
47	Durairaj	079837	65	M	RTA	-	-	-	Liver laceration - suturing done	Discharged
48	Navaneetham	080117	18	M	Accidental fall	ground glass appearance	Free fluid (+)	-	Jejunal tear - primary closure	Discharged
49	Katturaja	081478	38	M	RTA	-	-	Splenic rupture	Splenectomy	Discharged
50	Balakrishnan	081338	45	M	RTA	Air under diaphragm	Free fluid (+)	-	Ileal perforation - Resection closure	Discharged